REMARKS/ARGUMENTS

Originally-filed Claims 1-18 remain unamended. In the above-identified Office Action, all pending Claims 1-18 were rejected under 35 USC § 103 as being obvious over the combined teachings of two or more of the following three references: (1) US Patent 5,794,005 (hereinafter "Steinman Patent"); (2) "SYMPHONY: A Fast Mixed Signal Simulator for BiMOS Analog/Digital Circuits" by Buch et al (hereinafter "Buch reference"); and (3) "Non-Integreal Event Timing for Digital Logic Simulation" by Ulrich (hereinafter "Ulrich reference").

Specifically, Claims 1-4 and 18 were rejected over the combined teachings of all three references. In rejecting Claim 1 the Examiner remarked in paragraph 2.1 at the bottom of page 2 and top of page 3 of the above-identified Office Action that Steinman discloses all of the limitations of Claim 1 except for not expressly disclosing that events occur at non-integral times and mixed signaling for mixed analog and digital circuits in a simulation model. These defects in Steinman's teachings were overcome by the Examiner as follows. The Examiner cited to the Buch reference for mixed signal simulation in the bottom half of page 3 of the above-identified Office Action. The Examiner cited to the Ulrich reference for non-integral event timing in the top half of page 4 of the above-identified Office Action.

Applicant respectfully requests the Examiner to withdraw the rejection of Claim 1 as being obvious over the combined teachings of the three references for the following reasons. First, the primary reference, namely the Steinman Patent is **non-analogous art.** The test for non-analogous art is first whether the art is within the field of the inventor's endeavor and, if not, whether it is reasonably pertinent to the problem with which the inventor was involved. In re Wood, 599 F.2d 1032, 1036, 202 USPQ 171, 174 (CCPA 1979). A reference is reasonably pertinent if, even though it may be in a different field of endeavor, it logically would have commended itself to an inventor's attention in considering his problem because of the matter with which it deals. In re Clay, 966 F.2d 656, 659, 23 USPQ2d 1058, 1061 (Fed. Cir. 1992).

The present application identifies the field of the inventor's endeavor as being computer simulation of analog and mixed signal digital-analog physical circuits and systems and more particularly to the scheduling of non-integral times for simulation events.

See the Applicant's originally-filed application at the top of page 1. Applicant's Claim 1 explicitly calls for **a digital computer** (see lines 2-3 in the preamble of Claim 1). Therefore, Claim 1's method is to be used in a single computer. Applicant submits that the Steinman Patent is not within the just-described field of invention. This is because the Steinman Patent is in the field of discrete event simulation of objects using a plurality of synchronous **parallel computers** in communication with each other so that the objects being simulated may interact (emphasis added; see Steinman's "Technical Field" description at column 1, lines 26-30). A reference from parallel computing is not within the field of performing mixed-signal simulation in a single computer. Furthermore, the Steinman Patent is not reasonably pertinent to the problem with which the inventor was involved, because there are no issues of parallel computing raised when performing mixed-signal simulation in a single computer. Hence, the Steinman Patent is non-analogous art. Therefore, the Steinman Patent cannot be used to reject Claim 1.

Second, Applicant respectfully traverses the following statement at the bottom of page 2 and top of page 3 of the above-identified Office Action "As regards independent Claim 1 the Steinman reference discloses scheduling events in a simulation model for digital circuits (Figures 1-16), using hash buckets ..." (emphasis removed). **This statement in the Office Action is incorrect.** Specifically, the undersigned has carefully reviewed Figures 1-16 of the Steinman Patent and found no disclosure whatsoever of "a simulation model for digital circuits" as stated in the Office Action. Instead, the Steinman Patent appears to only disclose (in Figures 1-16) a simulation object 15 (which is shown as a circle) without additional specificity. There is no disclosure whatsoever in the entirety of Steinman Patent that simulation object 15 is a digital circuit. In fact the words "digital circuit" occur nowhere in the entire Steinman Patent. Therefore, the Steinman Patent cannot be used to reject Claim 1 for this additional reason.

Third, Applicant submits that modification of the method of the Steinman Patent for performing analog-digital mixed signal simulation requires **extensive re-design** of a type not disclosed or suggested by the Buch reference. Specifically, section 2.2 on page 404 of the Buch reference merely discloses that their Symphony simulator uses event management. However, the Buch reference provides no detail on how their event management is organized and implemented. In the absence of such detail, how is a

skilled artisan to know that use of Steinman's hash bucket scheduling technologies would be successful in Buch's analog-digital mixed signal simulation, as stated by the Examiner in the bottom half of page 3 of the Office Action. For example, the **Buch reference states** that **some simulation frameworks** that interface fast, event-driven digital simulators with time point-driven analog simulators **can have problems** handling strong feedback from analog to digital (and vice versa) subcircuits (see the bottom of left column on page 403). The Office Action is silent as to whether or not such problems (or other unforeseen problems) will arise from use of Steinman's hash bucket scheduling technologies to manage events in Buch's analog-digital mixed signal simulation. The Examiner is hereby requested to explicitly state in the next Office Action their basis for a **reasonable expectation of success** in overcoming such documented problems.

Fourth, even assuming that the Examiner prevails on the above three points, the Steinman Patent simply fails to disclose a method that uses both a hash function and a heap, both of which are expressly required in Claim 1. Specifically, the Examiner stated at the bottom of page 2 of the above-identified Office Action that the Steinman Patent discloses "... using hash buckets (Figures 4 and 5), organizing the scheduled times into a priority heap (Col.8 Lines 53-58) ..." While the Steinman Patent appears to disclose hash buckets, there is no indication whatsoever that the hash buckets are to be used with priority heaps. Specifically, the text cited by the Examiner in Col.8 Lines 53-58 is reproduced below:

> This simple approach for managing the event list is faster than
> single-event insertions into linked lists. It can also outperform
> some of the more complicated data structures such as splay trees
> and priority heaps, if enough events are collected in the secondary
> queue on the average for each cycle.

As seen from the above-quoted text, the Steinman Patent which is the **primary reference, teaches away** from use of a heap in combination with hash buckets as recited in Claim 1. Specifically, the Steinman Patent teaches in the above-quoted text that priority heaps are "more complicated data structures" and their use can be outperformed by Steinman's method (in which two lists are continually maintained, with a primary list being sorted and a secondary list being unsorted, as stated at column 8, lines 35-38). As would be apparent

to the skilled artisan, Steinman's use of two lists does not disclose or suggest use of priority queues, especially when taking into account that Steinman denigrates priority queues. Also, the Examiner has not cited any other reference for use of priority heaps. Therefore, the combined teachings of the three references fail to disclose or suggest the use of a heap with hash buckets as recited in Claim 1, which is therefore patentable for this additional reason.

Fifth, Applicant respectfully submits that although the Ulrich reference mentions non-integral event timing in its title, the method disclosed in "The Event Scheduling Process" (right column on page 61 and bottom half of page 62) subdivides the time axis between two integral times into a "large" number of intervals (the example in Fig. 2 uses 8, the text later states 256 or 512). The implication of these number of intervals is that the Ulrich reference uses an integral time with a higher resolution than a time unit (1/8 for the example, 1/256 or 1/512 for the text). Therefore, applying term "non-integral event timing" to Ulrich's methodology is superficial in the sense that the Ulrich reference appears to teach the use of an integer representation of simulation time as is done conventionally. For this reason, the technology of the Ulrich reference suffers from exactly the kind problems described in the originally-filed application on page 2, e.g. deciding the size of the time wheel, and expensive re-organization of the time wheel.

Moreover, there is no indication in the Ulrich reference that using the Steinman Patent's scheduling technologies would permit non-integral event timing of the type problems described in the originally-filed application on page 3, e.g. when the delay between scheduled simulation times can be both very small and very large (i.e. the minimum resolvable time can vary), the time must be represented as a real number (non-integer).

Sixth, Applicant respectfully traverses the Examiner's motivation for modification of the Steinman Patent as stated in the middle of page 3 of the above-identified Office Action, as follows (original emphasis in italics):

SILICON VALLEY
PATENT GROUP LLP

2350 Mission College Blvd
Suite 360
Santa Clara, CA 95054
(408) 982-8200
FAX (408) 982-8210

> The Steinman reference discloses that there is a need in the simulation art to support *multiple simulation strategies* and *other algorithms* (Col. 17, Lines 46-61). An artisan of ordinary skill in the art, presented with the problem of simulating a mixed signal integrated circuit would ...

Specifically, the above-quoted **Office Action statement is incorrect** because Steinman's column 17, lines 46-61 discloses "**synchronization** strategies" which are not same as the "**simulation** strategies" stated in the Office Action. Moreover, the "other algorithms" referred to by Steinman are "for **synchronizing** parallel discrete-event simulations" (column 17, line 50; emphasis added). Note that these remarks apply to the Examiner-cited motivation for both the Buch reference and the Ulrich reference, because the Examiner made the same remark about simulation strategies and algorithms.

Also, there is no indication whatsoever by Steinman or by Buch as to why a skilled artisan, when presented with the problem of simulating a mixed signal integrated circuit, would specifically select the Steinman Patent's scheduling technologies. For example, the Examiner has listed on page 7 of the Office Action at least two additional references for event handling (namely USP 6,324,495 and USP 6,466,898) and yet the Examiner has given no reason whatsoever for why the skilled artisan would specifically use the Steinman Patent but not such other references, for combination with the Buch reference. If the Examiner continues to make this rejection, the Examiner is hereby requested to explicitly state in the next Office Action, why the Steinman Patent is to be used instead of US 6,324,495 and US 6,466,898. As stated by the Court of Appeals for the Federal Circuit (emphasis added), "[A] rejection cannot be predicated on the mere identification . . . of individual components of claimed limitations. Rather, particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected **these components** for combination in the manner claimed." In re Werner Kotzab, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

Moreover, as noted above, the Steinman Patent does not provide any disclosure for simulation of digital logic. Therefore, the Examiner's reasoning at the top of page 4 of the above-identified Office Action is without merit. Furthermore, the Examiner has not explained why the skilled artisan would pick the Ulrich reference for combination, i.e. why is Ulrich's method any more efficient than all the other prior art references? In this context, note that the Examiner has **cited the entirety of the Ulrich reference** in support of their position that Ulrich reference describes an efficient digital simulation method. In a future Office Action, the Examiner is hereby requested to provide a **pin-point citation** of a single

line or a handful of lines wherein Ulrich teaches an efficiency advantage that the Examiner cites.

In view of the above arguments, Applicant respectfully requests the Examiner to withdraw the prior art rejection of Claim 1. Claims 2-18 are also believed to be patentable for one or more of the reasons discussed above.

New Claims 19-21 are being added. For support, see the originally-filed patent application at page 3, line 27. New Claims 19-21 are also believed to be patentable over the references of record.

For one or more of the above reasons, Applicant respectfully requests allowance of all pending Claims 1-21. Should the Examiner have any questions concerning this response, the Examiner is invited to call the undersigned at (408) 982-8200, ext. 3.

Via Express Mail Label No. **EV 448 867 250 US**

Respectfully submitted,

Omkar K. Suryadevara
Attorney for Assignee
Reg. No. 36,320